



Test Report: ENC-180-24

180W Desktop Single Output Battery Charger

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Control Function Test
Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

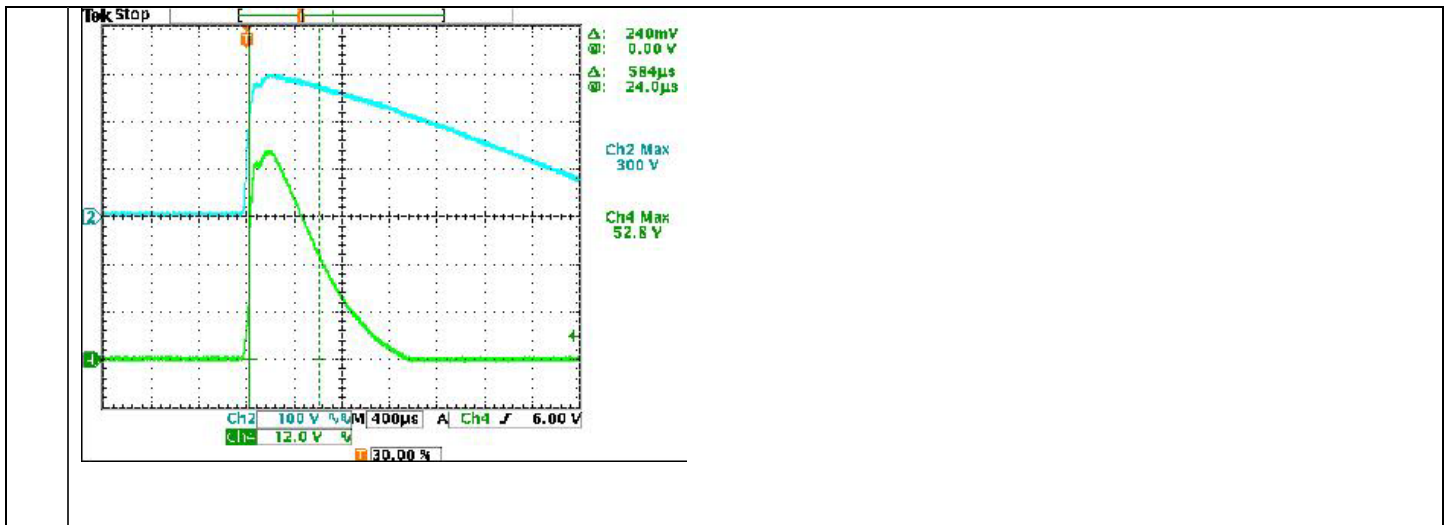
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BOOST CHARGE VOLTAGE	28.8V±0.4V	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	28.86V
2	FLOAT CHARGE VOLTAGE	27.6V±0.4V	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	27.65 V
3	OUTPUT CURRENT	6A±0.6A	I/P: 230 VAC O/P:C.V MODE-2V Ta:25°C	6.12 A
4	LEAKAGE CURRENT FROM BATTERY (TYP)	<1mA	I/P: AC OFF O/P:BAT. LOAD Ta:25°C	243 μA

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~264VAC	I/P:TESTING O/P:BAT. LOAD Ta:25°C	75V~ 264 V
			I/P: LOW-LINE-3V=87 V HIGH-LINE+15%= 300 V O/P:BAT. LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE)	TEST: OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 100 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK
3	LEAKAGE CURRENT	< 3.5 mA / 240VAC	I/P: 240 VAC O/P:Min LOAD Ta:25°C	L-FG: 0.8mA N-FG: 0.8mA
4	INPUT CURRENT (TYP)	230 V/ 0.95 A 115 V/ 1.9 A	I/P: 230 VAC I/P: 115 VAC O/P:BAT. LOAD Ta:25°C	I = 0.85A/ 230VAC I = 1.7A/ 115VAC
5	POWER FACTOR (TYP)	0.95/ 230 VAC 0.98/ 115 VAC	I/P: 230 VAC I/P: 115 VAC O/P:BAT. LOAD Ta:25°C	PF= 0.957 230VAC PF= 0.99/ 115VAC
6	EFFICIENCY (TYP)	92%	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	93.8%
7	INRUSH CURRENT (TYP)	230 V/ 70 A COLD START	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	I = 52.8A/230VAC T50= 584 us/230V
INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH1: Input current (1V=1A)				



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	CH1:31~36.5V PROTECTION TYPE : Shut down and latch off o/p voltage, re-power on to recover	I/P: 264 VAC I/P: 90 VAC O/P:TESTING Ta:25°C	32.33V/264VAC 32.28V/ 90VAC PROTECTION TYPE : Shut down and latch off o/p voltage, re-power on to recover
2	OVER TEMPERATURE PROTECTION	SPEC: NO DAMAGE PROTECTION TYPE : Shut down O/P voltage, recovers automatically after temperature goes down	I/P: 264 VAC I/P: 90 VAC O/P:BAT. LOAD	O.T.P.Active PROTECTION TYPE : Shut down O/P voltage, recovers automatically after temperature goes down
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE PROTECTION TYPE : Shut down O/P voltage, re-power on to recover	I/P: 264 VAC O/P: NO LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : Shut down O/P voltage, re-power on to recover
4	BATTERY REVERSE POLARITY	By internal fuse.	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	Fuse open

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT				
1	TEMPERATURE COMPENSATION	Constant voltage point(V)			I/P: 230 VAC O/P:NO . LOAD Ta:25°C	Constant voltage point(V)		
		Ta=0°C	Ta=25°C	Ta=50°C		Ta=0°C	Ta=25°C	Ta=50°C
		29.6±0.4V	28.8±0.4V	27.9±0.4V		29.76V	28.86V	27.91V
2	Charging curve	I/P:230Vac O/P:TESTING Ta:25°C						

	<p>Start →</p> <p>Charge Voltage: V_{boost}, V_{float}</p> <p>Charge Current: 100% CC, 10% CC</p> <p>Color of LED: Orange (stage 1, 2), Green (stage 3)</p> <p>© Suitable for lead-acid batteries (flooded, Gel and AGM) and Li-ion batteries (lithium iron and lithium manganese).</p> <table border="1"> <thead> <tr> <th>MODEL</th> <th>Constant voltage(V_{boost})</th> <th>Float (V_{float})</th> <th>Constant current</th> <th>Turn state current</th> </tr> </thead> <tbody> <tr> <td rowspan="2">24V</td> <td>$28.8V \pm 0.4V$</td> <td>$27.6V \pm 0.4V$</td> <td>$6A \pm 0.6A$</td> <td>$0.6A \pm 0.4A$</td> </tr> <tr> <td>28.86V</td> <td>27.65V</td> <td>6.12A</td> <td>0.41A</td> </tr> </tbody> </table>	MODEL	Constant voltage(V_{boost})	Float (V_{float})	Constant current	Turn state current	24V	$28.8V \pm 0.4V$	$27.6V \pm 0.4V$	$6A \pm 0.6A$	$0.6A \pm 0.4A$	28.86V	27.65V	6.12A	0.41A
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<p>3 LED Status Indicators</p>	<table border="1"> <thead> <tr> <th>LED</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td></td> <td>Float (stage 3)</td> </tr> <tr> <td></td> <td>Charging (stage 1 or stage 2)</td> </tr> </tbody> </table> <p>RESULT : TEST OK</p>	LED	Description		Float (stage 3)		Charging (stage 1 or stage 2)								
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COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q 902 Rated 500V/12A	I/P:High-Line +3V = 267 V AC ON/OFF VDS : O/P: (1)CV=27.6V (2)OUTPUT SHORT (3)CV=27.6V continue I/P:High-Line +3V = 97 V AC ON/OFF VDS : O/P: (1)CV=27.6V (2)OUTPUT SHORT (3)CV=27.6V continue Ta:25°C	VDS : (1) 431V (2)455V (3) 435V VDS : (1)495V (2)459V (3) 435V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated 600V/18A	I/P:High-Line +3V = 267 V AC ON/OFF VDS : O/P: (1)CV=27.6V (2)OUTPUT SHORT (3)CV=27.6V continue I/P:High-Line +3V = 97 V AC ON/OFF VDS : O/P: (1)CV=27.6V (2)OUTPUT SHORT (3)CV=27.6V continue Ta:25°C	VDS : (1) 495V (2) 427V (3)483V VDS : (1) 544V (2) 439V (3) 540V
3	P.F.C DIODE	D1 Rated 8 A/600V	I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)CV=27.6V	(1) 439V (2) 431V (3) 439V

			(2)OUTPUT SHORT (3)CV=27.6V continue Ta:25°C		
4	Diode Peak Voltage	Q 100 Rated 75V/80A Q101 Rated 75V/80A	I/P:High-Line +3V = 267 V AC ON/OFF O/P: (1)CV=27.6V (2)OUTPUT SHORT (3)CV=27.6V continue (4) NO LOAD Ta:25°C	Q100: (1) 63.3 V (2) 12.6 V (3) 64.1 V (4) 60.1 V	Q101: (1) 68.9V (2) 10.2V (3) 63.3V (4) 61.7V
6	Input Capacitor Voltage	C 5 Rated 150Uf /420V	I/P:High-Line +3V =267 V O/P: (1)CV=27.6V (2)OUTPUT SHORT (3)CV=27.6V continue Ta:25°C	(1) 420V (2) 419V (3) 415V	
7	Control IC Voltage Test	PWM IC U1 Rated 9.5V~ 28V PWM IC U901 Rated 10V~20 V	I/P:High-Line +3V =267 V O/P: (1)CV=27.6V (2)OUTPUT SHORT (3)CV=27.6V continue Ta:25°C	U1: (1) 16.37V (2) 10.39V (3) 16.31V	U901: (1) 16.31V (2) 11.31V (3) 16.37V

SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	EN 60950-1 I/P-O/P: 3 KVAC/min I/P-FG:2 KVAC/min O/P-FG:0.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG: 0.6 KVAC/min Ta:25°C	I/P-O/P: 6.54 mA I/P-FG: 6 mA O/P-FG:5.85 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG:500VDC>100MΩ	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C	I/P-O/P: 13.3 GΩ I/P-FG: 6.77GΩ O/P-FG: 30GΩ NO DAMAGE
3	GROUNDING CONTINUITY	EN 60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	25mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	PASS
2	CONDUCTION	EN55022 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL/50% LOAD Ta:25°C	PASS Test by certified Lab
3	RADIATION	EN55022 CLASS B	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab

4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
6	SURGE	IEC61000-4-5 LIGHT INDUSTRY L-N :1KV L,N-PE:2KV	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A

RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																																
1	TEMPERATURE RISE TEST	MODEL : ENC-180-12 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 1.5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 50 °C																																																																																																																		
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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/100VAC O/P : 100 % LOAD Ta= -35 °C	TEST : OK
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK
4	TEMPERATURE COEFFICIENT	± 0.05 %/°C (0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.027 %/°C (0~50°C)
5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C ~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 5 CYCLE 5. Input/Output condition : STATIC		OK
6	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°C ~ +55°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 15cycle:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test		OK
7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 2G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C		TEST : OK
8	CAPACITOR LIFE CYCLE	SUPPOSE C109 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 50 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50 °C LIFE TIME		(1) 336391HRS (2) 65937HRS (3) 134946HRS (4) 239512HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 1445.6K hrs min. Telcordia SR-332 (Bellcore) ; 155.9K hrs min. MIL-HDBK-217F (25°C)		
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50°C		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	DANIEL GAO	SANFORD SU	VINCENT ZENG

12.10.30 A50-F031